

Missouri Resources

Winter 2014 • Volume 31 • Number 1

 **40
years**

Missouri Department of Natural Resources

director's comment

Picture a clear winter's day with not a cloud in sight – it must mean we are breathing clean, healthy air. How about a crystal clear Ozark stream of sparkling water – it must mean it is clean enough to *drink*. Sounds picture perfect – right? Well, not necessarily. Decades ago, we could see the visual impacts of pollution to our air, land and water quality. Our air quality was so contaminated metropolitan areas once urged people to stay home because the air was unsafe to breathe. The water in our lakes and rivers was littered with trash and pollutants, looking more like murky mug shots than picturesque portraits.



This southwest Missouri stream is impaired by bacteria, ammonia and dissolved oxygen.

It was time to improve our nation's natural resources. In 1970, the national Environmental Protection and Clean Air acts and later the Clean Water Act in 1972 were among the first environmental laws created that built the legal foundation for a healthier America. In 1974, the people in our great state recognized the need to protect and preserve their resources and created the Missouri Department of Natural Resources.

During the last 40 years, we have made significant improvements to our state's air, land and water quality. We've properly disposed of nearly 17 million scrap tires in Missouri. With your help, the department has enacted state plans to address poor air quality and reduce emissions from permitted facilities. We've improved water quality by issuing permits to point sources to control the quality and amount of pollutants that enter our waters. Lest we not forget how science and technology have developed and improved over time, and have allowed fair and enforceable federal standards to be strengthened. Lab equipment once measured sample constituents in parts per thousand; now we measure parts per billion.

You have joined with us to improve Missouri's natural resources and public health, giving us all great reason to pause and celebrate a successful 40th



anniversary. While we no longer see the dark, polluted skies or the streams lined with waste – we now know that looks can often be deceiving. The department's increased data and monitoring document this fact. Our next set of environmental challenges will include some obstacles we will have to identify, through due diligence, and fix, with sound science. With your help, we will continue to work together to provide all Missourians a healthy environment in which to live, work and recreate.

Sara Parker Pauley
Missouri Department of Natural Resources

Missouri Resources

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Mission Statement

The mission of the Missouri Department of Natural Resources is to protect, preserve and enhance Missouri's natural, cultural and energy resources.

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2 Capitol Fossils

by Patrick Mulvany

Paleontologists say there are two places to find a fossil – in the field and in a museum. Missouri’s State Capitol is clearly both the seat of government *and* a museum. The walls and floors made of Missouri limestone are filled with fossils, embedded and polished for your viewing pleasure.

8 Winter Fun in Missouri State Parks

by Tom Uhlenbrock

Missing are the spring peepers, summer whip-poor-wills and crunching fall leaves. The sensory extravaganza that awaits you during winter activities in a Missouri state park is breathtaking. The crisp silence seems to beckon sounds from miles away.

13 A Silver Celebration 25 years – Missouri Stream Teams

by Susan J. Higgins

Founded in 1989, the first Stream Team hauled 14 tons of trash out of Roubidoux Creek in Pulaski County. Today Missourians join the 96,000 volunteers and 4,800 Stream Teams in celebrating their service and success.

departments

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Above: Missouri limestone provides a permanent monument to a variety of extinct marine animals. *DNR photo by Scott Myers.*

Front Cover: A grazing bison at Prairie State Park, near Lamar. *DNR photo by Scott Myers.*

Back Cover: A bluff-top trail at Castlewood State Park offers a birds-eye view of the Meramec River. *DNR photo by Tom Uhlenbrock.*

Capitol Fossils

In the limelight, so to speak

by Patrick Mulvany
photographs by Scott Myers



(Inset) This fossil reveals information about the relations and interactions between two living organisms. This Bryozoan encrusted a living crinoid column and radiated outward. Note the sediment-filled, star-shaped, central opening of the crinoid column.

Countless fossils are on permanent display inside the Missouri State Capitol. The impressive assortment of fossils is embedded in the marble-like limestone throughout the building. The word “fossil,” comes from the Latin word “fossilis,” which means “dug up.” Fossils that call the Capitol home represent a variety of extinct marine invertebrate life forms, including brachiopods, bryozoans, clams, corals, crinoids, nautiloids and snails. Hunting for them provides a chal-

lenge that is entertaining and educational. It’s good exercise, too.

“The stone used in the Capitol provides an excellent glimpse into the abundant marine life that once covered Missouri. Fossil treasures can be found in the Missouri limestone throughout the Capitol in the walls, floors, rotunda and even in the treads of the stairways,” said Carey Bridges, who serves as the Geological Survey Program director of the Missouri Department of Natural Resources in Rolla.

(Right) Limestone at the Phenix quarry, near Ash Grove. Stone from this quarry was used in the construction of the Missouri State Capitol. The production of limestone contributes about \$1 billion annually to Missouri's economy.

(Bottom right) Nautiloids are among the group of animals known as cephalopods, an advanced class of mollusks. They have a straight or coiled shell, divided internally into a series of chambers of increasing size connected by a central tube.

Capitol Was Built With Missouri Limestone

The current Missouri State Capitol was constructed between 1913 and 1917. The exterior and interior of the building were built from limestone that was quarried, shaped and dressed in southwestern Missouri at Carthage, in central Jasper County, and at Phenix, near Ash Grove, in northwestern Greene County.

For more than a century, Missouri's robust limestone industry has mined the rock and processed it into a variety of useful products, including building stone, for Missouri, the nation and the world. Limestone is the state's most abundant commercial mineral. The limestone in the Capitol's interior is polished to a glossy, reflective finish. It was during the construction of the interior that the polished Missouri limestone gained the distinction of being called "marble."

What is Marble?

Marble is calcium carbonate (CaCO_3) rock that takes a polish and can be used as architectural and decorative stone. Two kinds of rock qualify for use as marble – limestone and true marble. Limestone is a sedimentary rock that usually contains fossils. True marble is a metamorphic rock that forms when limestone is subjected to elevated temperatures and pressures in Earth's crust. True marble typically contains no fossils because the metamorphic process obliterates them from the rock. The marble-like rock in the Missouri State Capitol was cut

(continued on page 6)







- 1 Rugose corals are so named because their exteriors have a wrinkled appearance. The overall shape of some species is that of a single horn. The shape of others is that of a stack of horns inserted into one another. Therefore, both types are informally referred to as "horn corals." Rugose corals have septae radiating from the center (like bicycle spokes) when observed in cross-section. This horn coral (oblique cut) contains crinoid pieces.
- 2 Brachiopods are small marine animals that have two hard valves. They often have an extended hinge line that is so wide they look winged. The stone mason's blade cut right through both valves of the shell of this Spiriferid brachiopod.
- 3 Gastropods are invertebrate animals that include snails and slugs. This snail fossil is accompanied by many broken pieces of crinoids.
- 4 Brachiopods such as these once dominated the seafloor. Note the broken pieces of windowed bryozoan fronds that accompany the two fossils.
- 5 Attached to and branching outward from the crinoid column is a tabulate aulopodid coral named *Cladochonus*. Note the sediment-filled, star-shaped, central opening of the crinoid column. This fossil also reveals information about the relations and interactions between the living organisms.
- 6 Bryozoans like this corkscrew-shaped, windowed or lacy (fenestrate) bryozoan named *Archimedes* can be found throughout the Capitol. Funnel-shaped, fenestrate fronds coil spirally around the central screw axis.
- 7 This rugose coral (transverse cut) contains crinoid pieces and other small pieces of fossil debris. Note the septae (spokes). Large single-horn rugose coral fossils were referred to as "petrified buffalo horns" by settlers, due to their shape.

(Right) Geologists with the Missouri Geological Survey, Pat Mulvany, Ph.D., and David Bridges, Ph.D., investigate and identify fossils in the limestone walls, floors and stairways of the Missouri State Capitol.



The top of the Capitol dome towers 262 feet above the basement floor. The building, which covers three acres and has 500,000 square feet of floor space, is literally a museum of public art, remarkable not only for its quality and abundance, but as a faithful reflection of the themes, events, people and some of the ancient animals of Missouri.



(from page 3)

from fossiliferous limestone. True marble is not known to occur in Missouri.

Parts of a Crinoid – Missouri's Official State Fossil

Crinoids often appear as tiny discs of stone that may have a hole (often star-shaped) in their center. Loose pieces of stem often can be strung like beads. The fossil also is preserved as sections of stems with distinctive segmentation marks. Occasionally, it is possible to find the "cup" or "calyx," which protected the animal's soft body with a symmetrical "petal pattern" of calcium-rich plates atop the stem. The bottom of the stem of a crinoid was equipped with a fingered holdfast that was used to attach the animal to something on the seafloor, including rocks, firm sediment, coral colonies and bryozoan colonies. Today, hundreds of different species of crinoids exist in the warm, clear waters of the Pacific and Indian oceans and the Caribbean Sea.



Crinoid graphic is superimposed on the left to aid in interpretation of the text.

Capitol "Marble" Formed in Ancient Sea

The Phenix stone came from the Burlington-Keokuk Limestone sedimentary rock unit. The Carthage stone came from the Warsaw Formation sedimentary rock unit. Geologic formations typically are named for the geographic area in which they were first described. Burlington-Keokuk gets its name from Iowa cities and the Warsaw for the city of Warsaw, located in Benton County, Mo. The Warsaw Formation immediately overlies the Burlington-Keokuk. Both were formed in a warm, shallow, equatorial sea that covered Missouri during what geologists identify as the Mississippian Subperiod of geologic time, about 335 million years ago. Fine particles of calcium carbonate constantly precipitated from the seawater and eventually accumulated on the seafloor as lime mud.

The sea teemed with invertebrate life forms, including corals, bryozoans, brachiopods, snails, clams and crinoids. The hard parts of dead organisms also accumulated on the seafloor and mixed with the lime mud. Over time, this layer of sediment measured 50 feet thick, or greater. Further burial beneath hundreds of feet of sediment caused the lime mud to compact and turn into a limestone that contains many fossils.

Missouri Geological Survey



The Buehler Building, which is home to the department's Geological Survey and the Edward L. Clark Museum of Missouri Geology, is faced with limestone quarried from Carthage. It, too, contains a variety of fossils. Visitors to the museum can see corals, bryozoans, crinoids, trilobites, a mastodon tusk, rocks, minerals and other exhibits related to Missouri geology. The museum is located at 111 Fairgrounds Road, Rolla, and is open for self-guided tours from 8 a.m. to 5 p.m. weekdays, and is closed holidays. For more information visit dnr.mo.gov/geology/edclarkmuseum.htm.

What You Will Find and Where to Start

Numerous fossils may be found on each of the four levels of the Capitol. The first floor of the Capitol is home to the Missouri State Museum. Missouri State Parks, a division of the Missouri Department of Natural Resources, operates the museum. Visitors are encouraged to stop by the tour desk to pick up a Fossil Tour Map to help locate some of the impressive fossils. Keep in mind that what you see on the flat marble-like surfaces are two-dimensional cross sections of the fossils, so you need to use your imagination to visualize them in three dimensions. A flashlight comes in handy on the second floor.

Missouri State Museum

Plan to spend time enjoying for the fossils in the Missouri State Museum and throughout the Capitol. The Missouri State Museum is where visitors go to immerse themselves in the captivating history of the Show-Me State.


"The Missouri State Museum provides a great opportunity for visitors of all ages to experience the history of our state," said Bill Bryan, director of Missouri State Parks. "From exhibits honoring Missourians who have served their country to displays outlining the many natural resources that our state has to offer, the museum tells the story of

our state's past, present and future."

Don't miss the museum's impressive collection of exhibits that portray Missouri's natural and cultural history in its two main exhibit halls – the Resources Hall and the History Hall. More than 30,000 artifacts and objects from all aspects of Missouri's cultural and natural history have been collected since the museum was established in 1919. Its collections include more than 130 Civil War flags and a large collection of World War I flags.

There also are exhibits with rotating artifacts about state government and the Missouri State Capitol in the Missouri Veterans Gallery and the Foundations Gallery.

A series of traveling exhibits can be used as educational tools by schools, civic and other groups. Interpretive staff members at the museum offer various educational programs on aspects of Missouri's natural and cultural history.

The Missouri State Museum, which is part of the Missouri state park system, is located on the first floor of the Missouri State Capitol. For more information, contact the museum at 573-751-2854. For information on state parks and historic sites, visit mostateparks.com. 



Pat Mulvany is a geologist with the Missouri Geological Survey, a division of the Missouri Department of Natural Resources.

Winter Fun

in missouri state Parks

story and photographs
by Tom Uhlenbrock



Hikers, bikers and runners enjoy the snowy landscape at Castlewood State Park.

Dawn brought a sparkling surprise. Six inches of fluffy snow covered the front yard, piling high on the limbs of the blue spruce. Temperatures above freezing and a full sun in a cloudless sky would make quick work of this short-lived wintry spectacle.

I grabbed my gear, packed a couple of PB&J sandwiches, and was out the door be-

fore the rest of the house had stirred. A note gave my destination, and planned arrival back home.

I was headed to one of Missouri's prettiest parks, which would be stunning in this pristine mantle of white.

Hawn State Park is an hour's drive south from my home in St. Louis, on the west side of Interstate 55 from Ste. Genevieve in



The bluffs along the River Scene Trail at Castlewood State Park display a panoramic view of the Meramec River and surrounding wintry landscape of St. Louis County.

southeast Missouri. The park was open, but the plows were not yet out and the gate was still closed across the snow-covered road that led down into the valley.

I parked and began hiking, leaving behind the first human prints in the fresh snow, which already was crisscrossed with the tracks of deer and other wildlife residents. The early morning light slanting through the trees created a maze of shadows in the woods.

For me, the hiking season begins at first frost in the fall and extends through the bloom of the last woodland wildflowers in late May. The very first snow of the hiking season is like the sudden report of a starter's gun – I'm off and walking.

Hawn is a park for all seasons. Wild azaleas and yellow lady-slipper orchids bloom in the spring. The sand-bottomed pools in its shut-ins are perfect for a cool dip in summer. The mix of pines and hardwoods put on a gaudy show in the fall. A snowfall in winter brings a quiet peace to the valley.

With sandstone bluffs, which drip with ice sculptures in winter, and the largest stand of short-leaf pines in the state park

system, Hawn often looks more like Colorado than the Missouri Ozarks.

The park's 9.75-mile Whispering Pines Trail is the best full-day hike in Missouri. But I was content to wander along the short Pickle Creek Trail and enjoy the snow piled high on the granite boulders as the dark, clear water swirled round. Tiny, intricate ice formations clung to the rocks just above the waterline, reminding me of the delicate lace doilies that decorated Grandma's living room chairs.

Cold-weather hiking takes a few precautions. Perspiration can soak your clothes and cause a chill. The first layer should be synthetic underwear that wicks away moisture. Then add layers, maybe a fleece vest, with a wind-breaking shell on the outside. Gloves and a wool hat are necessities to help regulate body heat. Waterproof boots are a must.

If wind chills approach zero, every inch of skin should be protected. A couple of items that take very little room in a backpack can prove a necessity in the worst of weather. Outdoor shops sell chemical packets to warm the fingers and toes. And a



(Above) Pickle Creek Trail follows the scenic shut-ins at Hawn State Park.

(Below) A snowy hike along Pickle Creek encountered only one other hiker on the trail.

fleece balaclava weighs next to nothing but is a full hood that leaves only the eyes exposed.

I spent three hours roaming, and photographing, the winter wonders of Pickle Creek. The only sounds were the tumbling of the water through the rocks and the calls of cardinals, titmice, blue jays and various species of woodpecker.

I was startled to hear the crunching of an approaching hiker. We nodded, without breaking the silence of the solitary experience.

Find your winter hike experience on Jan. 1. Missouri State Parks, a division of the Missouri Department of Natural Resources, is encouraging people to get outside this winter by celebrating the New Year with a guided “First Day Hike” in

a state park. Visit mostateparks.com to see which parks are sponsoring hikes, and the schedules. America’s State Parks is promoting the Jan. 1 outing in all 50 state park systems.

Missouri, which has been voted “the best trails state” by American Trails, a national hiking organization, has more than 230 trails in 58 parks and historic sites. A guide to all of them, “*Trails of Missouri State Parks*,” is available at mostateparks.com and helps visitors choose a trail based on their needs and skill levels.

Here are five more state park trails that are a sure cure for cabin fever:

River scene trail, Castlewood State Park in St. Louis County:

This 3.25-mile trail may give the biggest bang for the buck of any trail in the state. Going clockwise, I start at the middle trailhead, which crosses a field and follows the bank of the Meramec River through the bottomlands of giant sycamores. Migrating geese sometimes rest on the gravel bars.

The trail climbs a wood stairway to come back along bluffs 200 feet above the river. There are several overlooks that provide stunning panoramic views of the landscape. A bonus may be an eyeball-to-eyeball look at the bald eagles that are permanent residents of the valley.

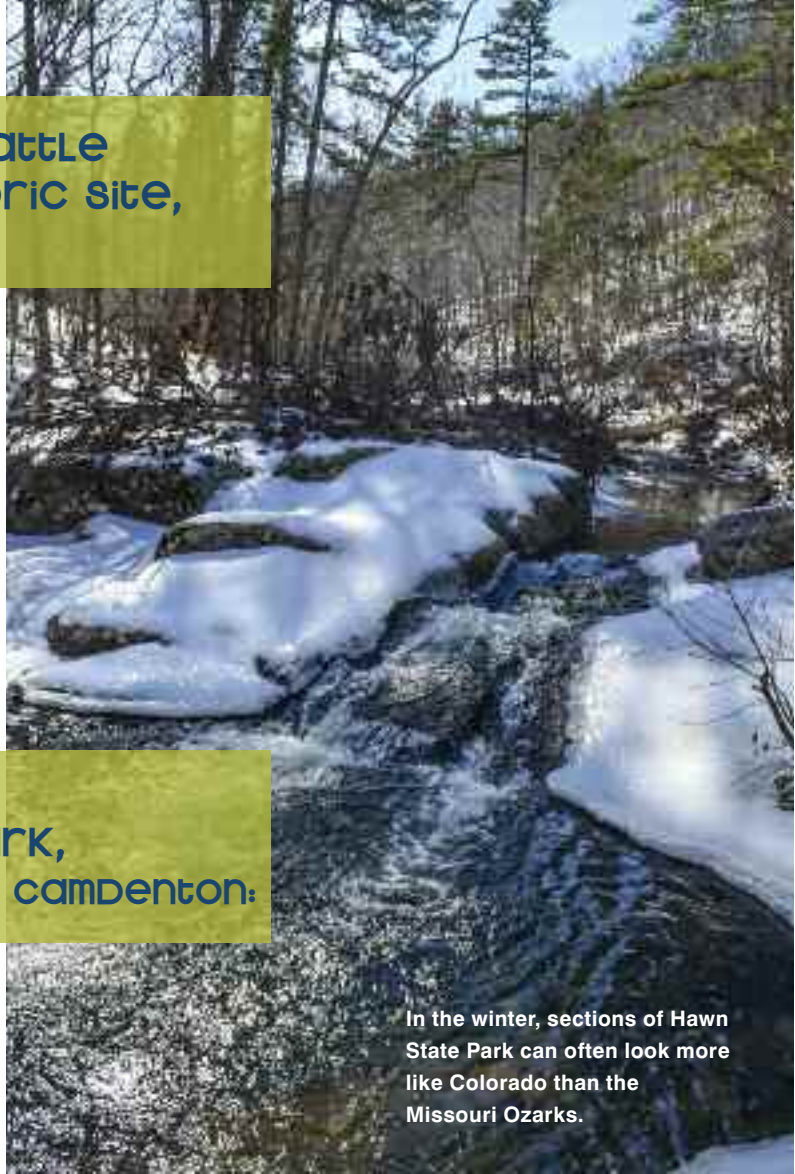


SNOW TRILLIUM TRAIL, BATTLE OF ATHENS STATE HISTORIC SITE, NORTH OF KAHOKA:

The park sits on the Des Moines River and is best known for a Civil War battle fought there in 1861.

However, the two-mile looping trail is especially beautiful in winter when the leaves are off the trees, allowing for a better view of the geology and the river valley.

“You could see a dozen to two dozen bald eagles along the bluffs,” said Jerry Toops, park superintendent of the historic site. “When it gets really cold, and the river freezes, they’ll move south to find open water near the dams.”



COLOSSEUM TRAIL, HA HA TONKA STATE PARK, FIVE MILES SOUTHWEST OF CAMDENTON:

The short trail shows off some of the park’s geologic wonders, including a natural bridge and the Colosseum Sinkhole.

“You get a completely different perspective of the park when the foliage is off the trees,” said park naturalist Larry Webb.

In the winter, sections of Hawn State Park can often look more like Colorado than the Missouri Ozarks.



Snow, sun and solitude at Hawn State Park.



Gans Creek Wild Area Trail System, Rock Bridge Memorial State Park, near Columbia:

“The trail has some higher elevations where you get views of the castle ruins across the ridge, and there’s the potential of seeing ice forming on the walls of the steep sinkhole.”

Some 8.5 miles of trail run through the 750-acre wild area, allowing hikers to enter a wilderness setting close by the city.

“You get to see a lot more of the karst topography when the leaves aren’t on the trees,” said Superintendent Jim Gast. “It’s a lot easier to see the deer and turkey in the wintertime.”

“There are places where you can’t see TV towers, water towers or any manmade structures. There are 110-foot bluffs, and caves that you can poke your head into. We get many visitors each year, but most of them haven’t discovered the wild area. It’s pretty peaceful back there.”

For more information, visit mostateparks.com.



Gayfeather Trail, Prairie State Park, Mindenmines:

Short-eared owls are among the winter residents of the park’s 4,000 acres of tallgrass prairie. So is a herd of some 100 bison.

“One year, there were 12 to 15 short-eared owls sitting along the gravel road,” said Brian Miller, the park manager. “It’s neat to see the snow pile up on a bison’s back. The thick wool insulates it up there, and doesn’t allow heat to get outside and melt the snow.”

“You’ve got a broad range of viewscapes all along the park. Usually, there are some areas, back a ways from everybody else, where you can see and feel what the original prairie was like.”

Tom Uhlenbrock is a writer for Missouri State Parks, a division of the Missouri Department of Natural Resources.

A St. Louis running club races on a sunny winter day at snowy Castlewood State Park.



25 Years Missouri Stream Teams

by Susan J. Higgins

Like many, Pat Haviland takes pride in the work she's done to beautify her backyard. Unlike most of us, however, her backyard is different – a river runs through it.

"The Jacks Fork is my backyard, and I like to keep my backyard clean!" said Haviland, who, with her husband, Ted, has been holding an annual cleanup on the Jacks Fork for 17 years. The first year they removed more than 8 tons of trash.

"It is nothing like the amount we used to collect," said Ted Haviland. "Overall, folks are keeping the river much cleaner. I like to believe we have the cleanest river in the state."

The Havilands, who are members of Stream Team 713 – Upper Jacks Fork River Rats, are among the more than 96,000 individuals in more than 4,800 Stream Teams who will be celebrating the Missouri Stream Team Program's 25th anniversary in 2014. Thousands of citizens who volunteer untold hours to help improve and protect the state's rivers and streams make the Missouri Stream Team Program, a partnership between the Missouri departments of Natural Resources and Conservation, and the Conservation Federation of Missouri, one of the oldest and most successful volunteer programs of its kind.

Scott Darrough and two other volunteers with the Ozark Fly Fishers (Stream Team 31) conduct a macroinvertebrate collection training session on the Current River, just outside Montauk State Park. Volunteers collect specimens using a 3-foot by 3-foot kick net.

DNR photo by Scott Myers.



(Top) The Big Piney River Stream Team Watershed Association (Stream Team 4623) cleans up trash on the Big Piney River. This event, on June 23, 2012, was their first event as a Stream Team association.

(Above) The Ladue Middle School Stream Team (Stream Team 76) conducts water chemistry monitoring at Deer Creek in St. Louis County.

In 1988, when the first River and Streams Conference was held in Jefferson City, the citizens who attended were asked what they would like to see in a river conservation effort. Their answer was threefold: 1) help us identify where water quality is good and where there may be problems; 2) offer us opportunities for hands-on experience in tackling problems and applying solutions; and 3) help us express our opinions in a

knowledgeable way. This became the foundation for the goals of the Stream Team program – stewardship, education and advocacy.

Stewardship

The Stream Team program was officially launched in February 1989, when Stream Team 1, the Roubidoux Fly Fishers, signed up. At that time, the Missouri Department of Conservation and the Conservation Federation of Missouri were the sponsoring partners. In their first project, the fledgling team removed 28,000 pounds of trash from about 1.5 miles of Roubidoux Creek, in Pularski County, in two colossal cleanups. One of those events was attended by Gov. John Ashcroft, who planted a memorial tree in Waynesville City Park to commemorate the occasion. In his remarks Ashcroft said, “A few of you have started a good thing here. You will know you are successful when tens of thousands follow in your footsteps.”

In the Stream Team program’s inaugural year, 100 teams signed on and began actively holding stream cleanup events in their own watersheds. As word spread, the program grew, and by the end of 1991 there were 273 teams representing more than 7,000 Missouri citizens. Over the years, the program has continued to grow both in



The Bolivar Community Watershed Improvement Group (Stream Team 3151) conducts water chemistry monitoring on Bolivar's Town Branch in Polk County.

DNR file photo.

(Bottom) The Bolivar Community Watershed Improvement Group inspects macroinvertebrates from the kick net as part of the monitoring activities on Town Branch during World Water Monitoring Day in October 2008.

DNR file photo.

numbers of Stream Teams and active volunteers, along with the activities they employ to help protect Missouri's aquatic resources.

Stream Teams are well known for trash cleanups – removing thousands of tons of refuse from our state's waters. But Stream Teams also participate in many other activities: they mark storm drains to raise awareness that they drain to streams; plant trees to stabilize stream banks; remove invasive species; and attend or organize events to educate fellow citizens about the plight of Missouri's abundant stream resources.

Education

In 1993, the Missouri Department of Natural Resources became a partner in the Missouri Stream Team Program and volunteer water quality monitoring was added as a new activity. A series of free workshops DNR created taught participants the fundamentals of water quality monitoring. Funds were allocated by sponsoring agencies to supply equipment for the newly trained volunteers.

Stream Team monitors – now 4,000 strong – provide valuable water quality data to the department. Soon thereafter, a Stream Team Academy was established to further educate volunteers on issues related to rivers and streams.

Stream Teamers can learn about a diverse multitude of related topics: fish, mussel, or crayfish identification; how stream hydrology works; how to advocate for water resources; and even how to build

a plywood canoe, among many other fun and educational subjects.

Billy Backues, a Missouri Master Naturalist from Stream Team 4193-Lake Ozark Area Chapter, was born and raised in the Ozarks. His fondest memories are of family activities in and around the beautiful Ozark streams. Backues was introduced to Stream Team through the Master Naturalist Program.

"It immediately appealed to me to be able to do something useful while being in and around the beautiful streams I had always enjoyed," said Backues. "I would be hard pressed to single something out that I





DNR file photos

Volunteers haul trash from the Bourbeuse River as part of Operation Clean Stream in August 2009. (Right) Stream Team volunteer water quality monitoring is part of the curriculum at Ladue Middle School in St. Louis County.



like best about the program, but near the top of the list would be the people I have worked with, from staff to other volunteers. They are all top notch. I'm a Stream Teamer for life."

Advocacy

"The Stream Team program is a crucial citizen effort that truly makes a difference in the quality of Missouri's streams," said Holly Neill, executive director of the Missouri Stream Team Watershed Coalition. "We are very lucky to have passionate individuals throughout the state that volunteer their time to protect and improve our valuable water resources. One of the most beneficial accomplishments of the program is the elevated awareness of our water resources and their importance to all Missourians. Because of the Missouri Stream Team Program, thousands are conscious of the significance our rivers and streams provide to our state and are actively taking a role in protecting them."

The Missouri Stream Team Watershed Coalition was formed in 1999 to help fulfill the Stream Team program's goal of advoca-

cy. MSTWC works to assist the program by promoting and supporting watershed-based Stream Team associations and acting as a resource for information and education. The group also facilitates communication among associations and serves as a united voice for healthy watersheds in Missouri. MSTWC published two *State of Missouri's Streams* reports that highlight volunteer water quality data, and work to raise the visibility of the program and Missouri's rivers and streams through advocacy.

Since 2013, thanks to MSTWC, Missouri citizens have had the opportunity to show their commitment to water resources by getting a Missouri Stream Team specialty li-



DNR photo by Scott Myers



DNR photo by Scott Myers

cense plate. More information about the license plate can be obtained by visiting mstwc.org. The Missouri Stream Team Program assists many other organizations, such as the Ozarks Water Watch Volunteer Water Quality Monitoring project in the Upper White River basin in southwest Missouri.


"Stream Teams are wonderful to work with and provide valuable data that we use in our annual *Status of the Watershed* report," said Ronna Haxby, Project Manager for Ozarks Water Watch. "Teams are really active in the Ozarks and take pride in the beautiful streams and rivers that are such an integral part of this area. Everyone involved

with Stream Team should be proud of the way it has flourished in the last 25 years, and I hope it doesn't diminish in the next 25."

Haxby knows Missouri streams and rivers still face challenges, and that organizations like Stream Team keep stream advocacy alive and thriving.

"Their excitement is contagious and their passion is inspiring," Haxby said.

In 25 years, Gov. Ashcroft's tree has grown to maturity. In that same time, the Stream Team program has grown to more than 4,800 teams and approximately 96,000 individuals are volunteering on behalf of stream resources. To Pat Haviland, the motivation to continue maintaining her "backyard" lies in the future:

"I have heard people say that the children are our future, but I believe that our rivers and streams are our children's future." 



Susan J. Higgins is an environmental specialist in DNR's Division of Environmental Quality, Water Protection Program. She serves as the volunteer water quality monitoring coordinator and is responsible for the department's participation in the Missouri Stream Team Program.

Mark Van Patten, Stream Team biologist with the Missouri Department of Conservation, joins three volunteers in collecting macroinvertebrates during the Ozark Fly Fishers' annual water quality monitoring outing. The event was held on the Current River, just outside of Montauk State Park, southwest of Salem. (Left) After collection, the samples are sorted and counted.



DNR photo by Tom Uhlenbrock

A WINTER'S DAY AT MISSOURI'S HISTORIC HOMES

by Tom Uhlenbrock

Three grand mansions are among Missouri's 87 state parks and historic sites, and each makes for a great way to while away a winter's day. Tours take about an hour and explore the nooks and crannies, revealing secrets about their famous residents.

The homes contain furniture, clothing and other personal possessions, looking as if their long-gone owners had merely stepped out for the day.

HUNTER-DAWSON STATE HISTORIC SITE is in New Madrid on the Mississippi River at the southeast tip of Missouri. The home is an architectural gem with the Georgian, Greek Revival and Italianate elements that were popular in homes of the Old South. The 15-room house has seven bedrooms and nine fireplaces.

William Hunter, a successful dry goods dealer, had the house built in 1859-1860. Today, it contains a museum-quality collection of antique furniture that reflects the wealth of a Missouri family prior to the Civil War.

"Visitors get a real insight into how this particular family lived, and an insight into the Southern culture," said Michael Comer, natural resource manager of the site.

BOTHWELL LODGE STATE HISTORIC SITE is perched like a stone castle on a bluff north of Sedalia off Highway 65. It was built by John Homer Bothwell, who died in 1929 at the age of 80.

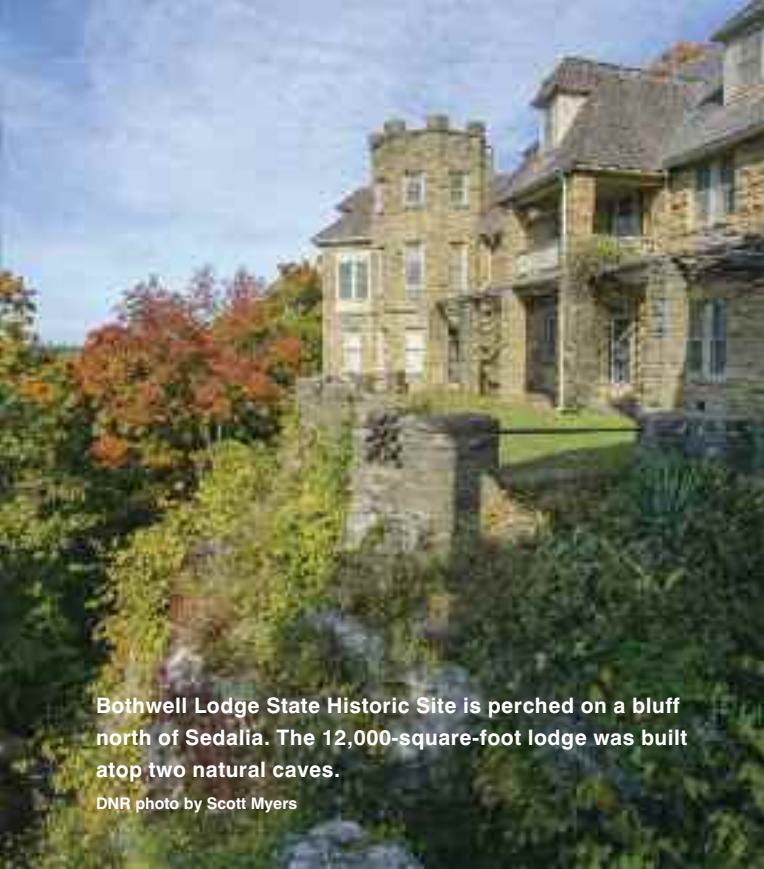
"Bothwell was a very prominent citizen of Sedalia," said Marissa Cowen, natural resource manager of the historic site. "He was a lawyer, politician, businessman and philanthropist. His dedication to the community and state of Missouri was genuine."

The Arts-and-Crafts style house sits on a bluff 120 feet above the surrounding countryside. It features a turret, and was built in four phases, the last completed in 1928. The house had five and a half bathrooms at a time when most Missourians still used outhouses.

Bothwell's wife of two years died after giving birth to a stillborn child. He never remarried nor had another child, but was well traveled, well read and filled the home's 10 guest bedrooms with friends and relatives nearly every weekend.

"He was a very active, very positive person," Cowen said. "Some of the neater things in the house are the souvenirs he picked up from the various places he traveled."

Cowen said many visitors come for the autumn colors in



Bothwell Lodge State Historic Site is perched on a bluff north of Sedalia. The 12,000-square-foot lodge was built atop two natural caves.

DNR photo by Scott Myers

fall and after a snow in winter to hike the trails that are part of the historic site.

THOMAS HART BENTON HOME AND STUDIO STATE HISTORIC SITE in the Westport area of Kansas City contains the personal belongings of one of Missouri's premier artists, his wife of 52 years, Rita Piacenza and the couples' two children.

Benton converted the carriage house at the rear of the four-bedroom home into a studio. He worked there nearly



DNR photo by Scott Myers



every day and died there on Jan. 19, 1975, at the age of 85. Rita died 11 weeks later. The studio displays paints, brushes and a stretched canvas, as if waiting for the artist's return.

The home contains 13 original Benton paintings, lithographs and sculptures.

"During tours, we talk a lot about his artwork, but also about his personality, his lifestyle, his work habits – you really get a sense of who he was," said Steve Sitton, site administrator. "We have his books, his paints, his clothes. Definitely, the favorite stop on the tour is his studio."

During the holiday season, the house is decorated with a tree hung with some of the Benton's ornaments. There also is a display of Christmas cards sent by the Bentons.

"He would take one of his paintings and use that as the front of the card," Sitton said. "We have about a dozen on display."

Many Missouri state historic sites have modified hours of operation and tour schedules during the winter months. For information on hours and admission at state historic sites, visit mostateparks.com.



Tom Uhlenbrock is a writer for Missouri State Parks, a division of the Missouri Department of Natural Resources.

(Opposite page) Hunter-Dawson State Historic Site contains a museum-quality collection of antique furniture. Descendants of the Hunter family occupied the house until 1958. In 1966, the city of New Madrid bought the house and donated it to the state a year later.

(Top right) A tour group visits Bothwell Lodge State Historic Site, which was built by John Homer Bothwell, a prominent lawyer of Sedalia. (Left) The studio at Thomas Hart Benton Home and Studio State Historic Site is preserved as it was when the artist died there in 1975.

DNR photo by Tom Uhlenbrock

Missouri Department of Natural Resources Turns 40

40 years

This year marks the 40th anniversary of the Department of Natural Resources, which was established under state reorganization in 1974. Missourians value clean air, water, soils and a healthy outdoors for recreation, and together we have achieved a great deal in the past 40 years. We will continue to work with and for all Missourians to ensure clean air, water and land for future generations to enjoy.

Watch for additional information about DNR's 40th anniversary in upcoming issues of *Missouri Resources* throughout the year.

Camp Pin Oak Lodge Reopens

Gov. Jay Nixon cut the ceremonial ribbon



reopening the Camp Pin Oak Lodge at Lake of the Ozarks State Park on Oct. 11. Nixon was joined by students and officials from State Fair Community College, and leadership from Missouri State Parks and the Missouri Department of Natural Resources.

The original structure, built in the 1930s by the Civilian Conservation Corps, caught fire during a late summer thunderstorm in 2010.

In 2011, Gov. Nixon announced a memorandum of agreement between Missouri State Parks and State Fair Community College in Sedalia for a training and education project with students rebuilding the lodge. The Missouri Department of Economic Development authorized a community development block grant of \$1.5 million to Pettis County to fund the project.

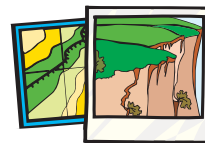
The finished Camp Pin Oak Lodge was built with careful attention to historical accuracy in the same location and approximate size of the original.

Amenities were designed to match the original building.

New Geologic Maps Published

The Missouri Geological Survey, a division of the Missouri Department of Natural Resources, recently published three new geologic maps. Staff geologists Edith Starbuck and Mike Siemens conducted field work in central Missouri and created bedrock geologic maps of the Guthrie, New Bloomfield and Osage City quadrangles. Geologic maps provide a baseline for data related to energy resources, mineral resources, natural hazards, water resources, soil conservation and climate science.

For more than 20 years, the Missouri Geological Survey has participated in the U.S. Geological Survey's STATEMAP component of the National



Time Exposures

As orange-tinted, sulfur-smelling water bubbles up into a concrete basin, it is hard to believe that Pertle Springs once hosted a bustling and successful mineral water resort. The resort, near Warrensburg, catered to thousands of health and pleasure seekers from far and wide. On summer weekends, a special train was set up to carry people back and forth from Warrensburg to the resort. Visitation was so heavy, the train made multiple daily trips. The Pertle Springs Resort and its Hotel Minnewawa often hosted Fourth of July picnics, temperance rallies, free-silver conventions, Chataquas, and camp meetings. It also included many other on-site amusements.

This August 1897 photograph documents the start of the annual family reunion of the James H. Russell, Sr., family of Chilhowee. Russell was born in Boonville in 1843, moved to Johnson County in 1866 by covered wagon, and later became a successful farmer. Russell's success as a farmer allowed him to enjoy family gatherings at destinations such as Pertle Springs. The background of the image shows part of what was once Stewart Cottage on the grounds of Pertle Springs Resort. Russell is seated near the left, holding an umbrella and hat.



Photo courtesy Ron Russell

Send your photo to "Time Exposures," c/o Missouri Resources, PO Box 176, Jefferson City, MO 65102-0176. Original photos will be returned via insured mail. Pre-1970 environmental and natural resource photos from Missouri will be considered. Please try to include the date and location of the picture, a brief description and any related historic details that might be of interest to our readers.

Cooperative Geologic Mapping Program. During this time, staff geologists have completed 210 bedrock and surficial material maps and completed four 1:100,000 scale maps. These maps may be purchased online from the Missouri Geology Store at missourigeologystore.com and at 111 Fairgrounds Road, Rolla. Web versions of the maps may be viewed online at dnr.mo.gov/geology/statemap/missouri-maps.htm.

Missouri State Parks Offers New Mobile Tour System

Missouri State Parks is piloting the use of hand-held mobile devices to provide audio tours at Weston Bend State Park near Weston, and Mastodon State Historic Site in Imperial.

Mobile tours will offer visitors another avenue to learn about the cultural and natural aspects of each site through historical images, written text, and audio commentary. The system is provided through the OnCell Mobile Tour System.

Once at a participating park or site, the mobile tour is accessible in a variety of ways. The full tour can be accessed through the internet, the On-Cell app, or by scanning a QR Code on each tour stop sign. The tour still can be accessed by smartphone or by calling the phone number listed on the tour signs. Once the number is called, the audio portion of the tour will play.

February is Earthquake Awareness Month

Each February, Missouri observes Earthquake Awareness Month. Three earthquakes, estimated at magnitude 7.0 or



greater, occurred along the New Madrid fault in the winter of 1811-12 and small earthquakes occur in Missouri daily. These earthquakes are a natural hazard that no one can accurately predict.

Fortunately, there are things everyone can do to be better prepared. To

Stream Team Notes

Gravois Creek Advocate Wins Ambassador Award



DNR photo by Kat Lackman

Mike Engle

life and we all look forward to spending time in Missouri's beautiful outdoors," said Engle. "I am honored and humbled by the 2012 Stream Team Ambassador Award because I know there are many other individuals who are as worthy as I to receive this honor. This will only make me work harder to justify receiving this award." Mike is currently doing a Cooperative Stream Investigation (CSI) project on Gravois Creek. He also monitors Little Indian Creek in Franklin County with wife Susie and son Jack.

Mike Engle is the Stream Team Ambassador Award winner for Volunteer Water Quality Monitoring for his work on Gravois Creek in 2012. Mike was born and raised in St. Louis and received a B.S. in biology from St. Louis University. After college, Engle spent two years in the U.S. Army working with waterborne and communicable diseases. This training taught him the problems that can arise when water resources become polluted. He later received a Ph.D. in biochemistry, also from St. Louis University. Mike's education and background fostered a great deal of respect for the chemistry and biology of ecological systems. "Fishing and hiking have always been an important part of my family's



raise awareness, geologists with the Missouri Department of Natural Resources will partner with local, state and federal agencies and organizations by participating in a number of public activities and educational opportunities regarding the basics of earthquakes. Missourians are encouraged to attend public events throughout the month. Learn more at dnr.mo.gov/geology/geosrv/earthquakes.htm.

DNR Education Web Page Posts Bonus MR Content

Starting in this issue of *Missouri Resources*, certain stories and content will include the icon pictured at right to indicate that additional educational content for that entry is available. Go to dnr.mo.gov/education to access



these, as well as other educational information and links.

The bonus content will vary from additional text that was not included in the print edition, to Web links for more information about the topic or related topics. The blue "e" icon in the print edition will be found on the education page next to the link for the online version of *Missouri Resources*.

The online version of *MR* can be accessed at dnr.mo.gov/magazine/index.html.

For news releases on the Web, visit dnr.mo.gov/newsrel.

For a complete listing of the department's upcoming meetings, hearings and events, visit the department's online calendar at dnr.mo.gov/calendar/search.do.

Looking for a job in natural resources? Go to dnr.mo.gov/hr.



Opening Day

a family tradition

by Tom Uhlenbrock

For many Missourians, the unofficial start of spring is March 1, when they show up at Bennett Spring, Montauk or Roaring River state parks for the opening of trout season.

For generations, families have lined up, elbow to elbow, to be the first to snag a lunker trout. If the fish aren't cooperating, no problem, you're still at one of the prettiest spots in the state.

All three parks are located in deep wooded valleys where azure springs pump out millions of gallons of water each day in a sort of Ozarks Garden of Eden. The source of the clear, clean water drew the first settlers, who built mills

for grinding corn and cutting timber.

The pristine water also proved a perfect habitat for trout. Two state departments, Natural Resources and Conservation, teamed up to create the state's popular trout-fishing parks. The Department of Natural Resources runs the parks, and Conservation operates the hatcheries and stocks the trout.

Here's what you'll find at the three parks:

Bennett Spring State Park near Lebanon

Bennett Spring is the fourth largest spring in the state with an average of a hundred million gallons a day. The flow bubbles up from the base of a steep bluff, and forms the Niangua River, which is a favorite for floaters in the southwest corner of the state.

Civilian Conservation Corps crews worked at the park in the 1930s and the springwater flows under a handsome triple-arched stone bridge that is part of the CCC legacy. Other vintage stone-and-timber buildings house a lodge and restaurant.

The park has a store that sells tackle and other supplies and offers 64 rental units, including cabins and a 10-room motel. The campground has 192 spaces with four shower houses. The park has a swimming pool and six trails, totaling 12.5 miles. The longest is 3.5 miles and leads through the woods to an unusual geologic formation called the Natural Tunnel.

Montauk State Park near Salem

Montauk Springs is a series of small springs that combine to pump out some 43 million gallons a day, forming the headwaters of the Current River, the state's top float stream and the jewel of the Ozark National Scenic Riverways.

The park has a lodge with a restaurant and store and 18 motel rooms. There also are 28 cabins and 154 camp sites with two shower houses in a campground next to the gurgling river. A grist mill built on the river in 1896 is open for tours in the summer.

The Department of Conservation also stocks the Current River outside the park boundaries on down to Akers twice monthly, meaning an angler can always find a secluded spot to wet a line.

Visitors to Montauk State Park may see the park's resident bald eagles, which have nested in the tall pines there for more than a decade.

(Top) While at Bennett Spring State Park, take time to fish the spillway, one of the signature features of the park.

DNR photo by Andrew Richmond.

(Right) Take your chances fishing the spring area of Roaring River State Park. The first trout hatchery was built here in 1910.



DNR photo by Andrew Richmond

(Above) Bennett Spring State Park hosts various scenic settings to support different styles of fishing.

(Right) Montauk State Park is home to many lunkers. Yours may be lurking there, awaiting a pheasant tail nymph.



DNR photo by Scott Myers



DNR photo by Andrew Richmond

Roaring River State Park near Cassville

As you approach the park, the rolling landscape of forest and farmland suddenly drops down into a deep canyon-like valley. A spring bubbles up from a fern-lined grotto at the base of a gray bluff, producing 20.4 million gallons each day to form the headwaters of Roaring River.

The first trout hatchery was built at the site in 1910, and was rebuilt by the Civilian Conservation Corps in the 1930s. The crews constructed 33 buildings and nearly all remain.

In 1998, the park dedicated the 26-room Emory Melton Inn and Conference Center. The facility, named for a life-long resident of Barry County and former 24-year state legislator, features wood beams and circular support columns of stonework, reflecting the earlier work and style of the CCC.

Roaring River also boasts one of the more stunning sights offered at the three trout parks. During wet weather, a waterfall drops 110 feet from the top of the bluff into the deep blue pool of Roaring River Spring.

“Spectacular” is the description of Dusty Reid, superintendent of the park.

For more information, visit mostateparks.com.



Tom Uhlenbrock is a writer for Missouri State Parks, a division of the Missouri Department of Natural Resources.

Rock Matters



Quartz

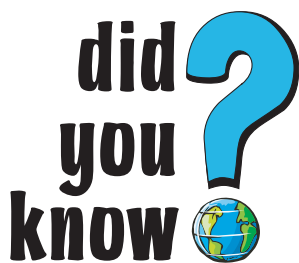
Quartz, a common and abundant mineral, is an important constituent of many different rock types. It appears as individual grains in sandstone, as microscopically fine grains in chert, as small crystals in sedimentary rocks, and as lustrous, angular grains in granite and rhyolite. It also is present as distinct crystals lining the hollow, spherical bodies of some geodes.

(Left) It isn't easy to tell what the inside of a geode holds until it is cut open or broken apart. (Bottom left) A quartz crystal. (Bottom right) A drusy quartz formed on dolomite with calcite crystals. DNR photos by Mark Gordon.

The hardness of quartz (seven on the Mohs scale) makes it harder than most other natural substances. The Mohs scale of mineral hardness is based on the ability of a harder mineral to scratch a softer mineral – talc being soft (1) and a diamond being hard (10). Quartz is usually colorless, transparent or translucent, and is harder than glass or steel. Ordinary acids do not attack quartz and it is relatively unaffected by chemical weathering in Missouri.

Quartz can be an excellent gemstone. It is hard and generally accepts a brilliant polish. Popular varieties of quartz

include: rose quartz, citrine and amethyst. Quartziferous river sand and gravel is used in concrete aggregate and a road material. Quartz forming on other types of rock is known as druse. Quartz occurring as drusy coatings on chert and in large masses is used for rock gardens or as ornamental stone. Pure quartz sandstone is used in the manufacture of glass. Drusy and banded quartz (agate) may be collected in the extensive barite mining area of Washington County, near the towns of Potosi, Mineral Point and Old Mines. Geodes found in extreme north-eastern Missouri are almost always lined with quartz crystals. Learn more about Missouri rocks and minerals: dnr.mo.gov/geology/docs/rocksetbooklet.pdf



Fifteen Percent of U.S. Households Use Private Drinking Water Wells

Did you know that approximately 15 percent of households in the United States rely on their own private drinking water sources? While public drinking water systems that serve many people are regulated by U.S. Environmental Protection Agency standards, it is the responsibility of individual owners to test and maintain private water wells.

If you rely on a private well for drinking water, the Missouri Department of Health and Senior Services provides a free water sample collection kit and will test your water for only \$10. The test will look for Coliform and E. coli bacteria and should be done at least annually, unless you suspect an interim problem.

Missourians having a private well drilled must select a proper location for the well and use materials and methods that meet established standards set forth by the Missouri Well Construction Rules. The construction of a safe well involves a partnership between the Missouri Department of Natural Resources, the permitted well contractor and the well owner. The department's Missouri Geological Survey is responsible for ensuring standards are met. They also license well and pump contractors performing work on wells in Missouri and investigate citizen concerns.

For more information on water testing, visit health.mo.gov/lab/privatedrinkingwater.php. For more information on private well construction and maintenance or to find a licensed well or pump installation contractor, visit dnr.mo.gov/geology/geosrv/wellhd/ or contact the Missouri Geological Survey's Wellhead Protection section at 573-368-2165.



Just the Beginning

by Jennifer Hoggatt

photograph by Scott Myers

Our state waters and watersheds have a story to tell, and we're listening. Every body of water has a watershed; it's the land around it that drains into it. Even our underground water has a watershed. And, the activities that occur on that land around or on top of a water body have an impact on that water body. Those familiar with a particular watershed know its story better than anyone, and we want to hear those stories, too.

Historically, the department has directed its efforts toward implementation of the federal Clean Water Act. In doing so, we focused on point-source discharges or discharges from a pipe. By addressing these types of discharges, we have made great strides in reducing pollution. However, pollutants remain and finding their source has become more challenging. Today, we often cannot "see" the source of pollution. Instead, we must "seek" the source of pollution. Seeking means listening to the story a watershed has to tell.

The department's watershed approach, known as Our Missouri Waters, began its pilot phase this past year. Throughout the year, we focused on three watersheds in the state to try out a new approach to gather and share information about what is really going on in each watershed. What are the concerns? What are the opportunities? What are the real challenges faced in addressing those concerns? Finding the answers to these questions is not the end, it is just the beginning. The Department of Natural Resources is committed to working with all partners toward practical actions that result in clean and abundant water for generations to come.

DNR hosted three summits to mark the start of a continuing process to



Cliff swallows soar above the Chariton River near the Chariton-Carroll county line.

discover the story of the watershed, set goals for the watershed and plan action that helps us reach those goals.

Currently, we are assessing how our process is working thus far and recommending improvements as we transition from a pilot to full implementation. In 2014, the department will begin its full implementation by starting conversations in additional watersheds throughout the state.

However, we won't forget about our three pilot watersheds. Their process

has only just begun. We will continue the conversations and continue to work toward our shared goals.

To follow our progress, to learn more about the watershed approach and to learn more about the events from the first three pilot watersheds – Spring River, Lower Grand and Big River – visit dnr.mo.gov/omwi.htm.

Jennifer Hoggatt is the department's statewide coordinator for the Our Missouri Waters initiative.

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First Day Hikes!

Join Missouri State Parks in celebrating the beginning of 2014 with First Day Hikes on January 1. First Day Hikes are promoted by America's State Parks, and you will be joining hikers from all 50 states that are connecting to the outdoors by taking a healthy hike.

Learn more and find a hike near you at mostateparks.com. Missouri State Parks is a division of the Missouri Department of Natural Resources.



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